fifteen years of the period over which they extend, when he had the command of comparatively large telescopes; and a similar remark applies to the measures of Baron Dembowski, who during upwards of twenty years has produced work of the greatest value in this department of astronomy. Dr. Doberck also gives us a provisional orbit for τ Ophiuchi, which Sir William Herschel in 1783 considered the closest of all his double stars; and after appearing single to Struve with the Dorpat refractor in 1825, was oblong in 1827, and is now an easy object. The period assigned is 185 years, with a peri-astron passage, 1820·63; the semi-axis, 1″·11.

THE STAR LALANDE 19662 (SEXTANS).—Mr. J. E. Gore, of Umballa, Punjab, in a letter printed in another column, directs attention to the probable variability of this star. It was observed by Lalande, 1798, April 10, "Histoire Céleste," p. 330, where its magnitude is entered 4½, as in the reduced catalogue published by the British Association (which, by the way, as well as the other two catalogues prepared at the instance of that body, is unfortunately becoming scarce). It appears in Heis's Atlas as a 6·7; but after searching through the modern catalogues where it was likely to be included, we have only discovered a single meridian observation by Lamont in his Zone 314, on 1845, April 5, when it is called 7·8. It does not occur in Argelander's "Uranometria," nor was it observed by D'Agelet, Bessel, or Santini.—Another of Lalande's stars, No. 23726 in Corvus, is in all probability variable. He estimated it 7½, 1795, May 10, and Bessel in May 1824 called it 8; Heis, however, saw it as a *fifth* magnitude. What is the actual degree of brightness? The star's position for the commencement of the present year is in R.A. 12h. 37m. 2s., and N.P.D. 103° 10′·3.

THE STAR 61 GEMINORUM.—The Rev. T. W. Webb has remarked the probable variability of a small companion of this star, distant about 1′, and not far from the circle of declination to the south (estimated angles from 160° to 190°), and appears inclined to identify it with Smyth's companion of the 9th magnitude, for which he gave, 1835·85, position 110°·0, distance 60″. Smyth's estimates of magnitude down to 9 may be generally relied upon, though for smaller stars he is often wide of the mark, according to our present standard. It is very possible that he may have caught one of the minor planets close to 61 Geminorum; his angle, though it has only his lowest weight, differs considerably from recent estimations for the faint star. Our principal object in referring to the Rev. T. W. Webb's remarks is, however, to suggest that 61 Geminorum may be itself variable; D'Agelet considered it 6 in October 1784. Piazzi observed it ten times on the meridian, and estimated it 7·8; it is 7 in Lalande, 6·7 in Taylor's volume for 1834-35, 6 in the "Uranometria" and Heis's Catalogue, 6·5 in "Durchmusterung," and 6·3 in the Radcliffe Observations, 1870. The deep yellow colour noticed by Smyth, and now stated to have disappeared, may perhaps be considered by some readers as an indication in the same direction.

COMETARY ASTRONOMY.—The *Astron. Nach.*, No. 2,034, contains a fine series of observations of the faint comet discovered by Coggia, 1874, August 19, taken at the newly-erected observatory of Col. Tomline, Orwell Park, Ipswich: it extends to the middle of November, and will no doubt be of material service in the final determination of the orbit. (The position of the Orwell Park Observatory is in long. 4m. 55·8s. E., and lat. 52° 0′ 33″). Vienna observations of the same comet appear in No. 2,035 of the above-named periodical, but extend only to October 19: they are accompanied by positions of Winnecke's Comet (1874, April 11) to June 17, and of the comet detected by Borrelly (July 25) to October 19.—In No. 2,036, Dr. Sandberg has given elements of the elliptic comet of Tempel, 1873, II., which will be preferable to any hitherto published. It will be remembered that this comet, near the preceding aphelion passage, experienced very heavy perturbations from the action of Jupiter, having approached that planet in January 1870 within 0·35 of the earth's mean distance from the sun. In the instantaneous ellipse at perihelion, 1867, May 23, the period of revolution was 2,080 days: at the last passage by the same point of the orbit, the perturbations had increased the period to 2,179 days. Other elements for 1873 are: semi-axis major, 3·2889; semi-axis minor, 2·9169; perihelion distance, 1·7695; the period in years is 5·965, so that we may expect to see the comet in the spring of 1879 under similarly favourable conditions for observation to those of 1867 and 1873.—In No. 2,037 we have definitive orbits (parabolic) for Comet 1870, IV., which was observed for only seven days, and of Comet 1871, II., both by Herr Schulhof, of the Observatory at Vienna. As the manner in which the elements are expressed may not be readily understood by the uninitiated in such calculations, we transcribe the orbits in the form that has so far been adopted in our catalogues. The perihelion passage is expressed in Greenwich time, and the longitudes are from mean equinox at commencement of the year.

	Comet 1870, IV.		Comet 1871, II.
Perihelion passage ...	Dec., 19·87609	...	July, 27·01925
Long. of perihelion ...	4° 8′ 56″	...	115° 35′ 44″
,, ascending node	94 44 43	...	211 54 40
Inclination	32 43 35	...	78 0 36
Log. perihelion distance	9·590242	...	0·031763
Motion ...	Retrograde.	...	Retrograde.

*LECTURES AT THE ZOOLOGICAL GARDENS**

III.

May 6.—*Mr. Garrod on the Deer Tribe.*

THE Deer may be defined as those Ruminant Artiodactylate animals in which deciduous horns are developed, and the young are spotted. Some, namely the Musk Deer (*Moschus*) and the Water Deer (*Hydropotes*), never have antlers; in both these the young, however, are spotted, as they are not in any of the hollow-horned Ruminants.

The degree of development of the antlers is closely related to the size of the species. In the small Pudu Deer and the Muntjacs they are simple or but slightly branched; whilst their branching is very considerable in the large Reindeer and Wapiti. The typical antler seems to consist of a main stem or beam, with a small basal, anteriorly directed tyne, the brow antler. The apex of the beam bifurcates, one branch being directed forwards, and a little external to the brow antler; the other starts from the inner side of the posterior surface. In one well-marked group, the *Elaphine*, the anterior of these upper branches is inconsiderable and does not branch, the posterior enlarging and branching in most—becoming palmated in the Fallow Deer. The larger species of this elaphine section, including the Wapiti, Maral and Red Deer, possess a second brow antler; whereas in the smaller species this is not found (*e.g.* the Fallow, Formosan, Mantchurian, and Japanese Deer). In the Mesopotamian Deer, recently discovered by Sir Victor Brooke, which is intimately related to the Fallow, the palmation is found in the basal portion of the antler, including the brow antler, together with extra small tubercles very frequently found in that region.

In the group of Deer called *Rusine* the bifurcation is more equal, and when there is a further branching, the anterior as well as the posterior branch participates in the division. The brow antler is simple. This type of antler is found in its most uncomplicated condition in the Sambur of India, and the closely allied species *Rusa equinus*, *swinhoii*, &c. of the Malay region and

* Continued from p. 9.

Formosa, as well as in the smaller Axis, Prince Alfred's and Hog Deer. In the Siamese Deer, named by Mr. Blyth after Mr. Schomburgh, the brow antler is long, whilst each of the two branches of the short beam again divides in a very regular manner, the ultimate tynes being of nearly equal length. In Duvaucel's Deer, from India, the beam is longer than in the last-named species, and the branching is very similar, except that the posterior bifurcation is less developed than the anterior. This reduction is carried to an extreme in Eld's Deer, from Eastern India, where the anterior division of the antler is very large and curved forward, whilst the posterior is represented by a minute tyne. The gradation between these three forms was demonstrated by Mr. Blyth. In the Reindeer the general conformation of the beam very closely resembles that of Eld's Deer, but with this rusine peculiarity, the strangely palmated brow antler is double, as only elsewhere occurs in the elaphine type. In the American Roes a similar conformation obtains, the brow antler being small in the Virginian Deer and almost absent in the Mule Deer, which latter species in the branching of the beam very closely agrees with both Duvaucel's and Schomburgh's Deer.

The South American Guazupucu (*Blastocerus paludosus*), which differs considerably from the Mazame, a species generally supposed to belong to the same genus, has the anterior bifurcated tyne. This may be the modified brow antler, as may be the similar branch in the Chinese Elaphure discovered by the Père A. David, both these species having a simple, or comparatively simple, posterior beam, and no gland on the outer side of the metatarsus.

The interpretation of the affinities of the Roebuck by means of its horns is not easy. In that species there are three small tynes, the anterior being situated higher up than is usually the case with brow antlers, and the two posterior much like those of the Hog Deer. In the last-named species, however, the brow antler is not low, and it is not difficult to imagine it being carried a little further up. On this assumption the Roebuck is the only European representative of the rusine type.

The simple nature of the antlers in the Brockets of South America and the peculiar Muntjacs of the Indian region, in which the horns are attached on the top of elongated pedestals, makes it impossible to decide, from them alone, the forms to which they are nearest allied.

As far as the hornless Musk and Water Deer are concerned, Sir V. Brooke has shown in how many points they differ from one another; whilst Prof. Flower, at a recent meeting of the Society, has demonstrated to a certainty that the former of them is not at all related to the Chevrotains, which they so closely resemble in size and general contour, and with which they have generally been associated.

The horns of the Elk do not agree with any of the above-described forms. The fan-shaped palmation into which they spread is based on a radiating framework, and no specialised brow antler is to be seen.

With reference to the geographical distribution of the Deer, none are to be found in the Australian or Ethiopian region, the Barbary Deer being the only member of the group found in Africa at all, and that north of the Sahara. The Elk is found both in North America and Northern Europe, as is the Reindeer. The larger Elaphines are represented in North America by the Wapiti, and by several closely-allied species distributed throughout the Palæarctic region as defined by Mr. Sclater to include Europe, North-west Africa, and Asia with the exception of India and the Chinese Empire. The smaller Elaphines abound in Japan, China, and Formosa. The true Rusas are most numerous in India and the Indo-Malay Archipelago, the most recently discovered species, named by Mr. Sclater *Rusa alfredi*, having been obtained by the Duke of Edinburgh from the Philippines, whilst *R. Swinhoii* is from Formosa.

Mr. Swinhoe's new Water Deer abounds at and near Shanghai, whilst the equally peculiar Elaphure probably has its home in South-west Mantchuria, though it exists in large numbers in a semi-domesticated state in the Imperial Park at Pekin, together with commoner species. The Musk Deer comes from India and the country north of it, and the Muntjacs are found in India and China, as well as the intermediate regions. The Cervidæ are also represented in North America by the Virginian, Mexican, and Mule Deer; the Guazus, Guemuls, and Brockets replacing them in the southern continent.

(*To be continued.*)

THE IRON AND STEEL INSTITUTE

THIS Association may now be fairly considered as having become an established institution in the country, and is to be congratulated on the success it has achieved in its attempt to introduce something like scientific method into the important industries with which it is connected. It is undoubtedly doing excellent work, and if it adheres steadily to its purpose, and goes on as it has begun, it will help greatly in enabling our iron and steel manufactures to keep pace with the rapid progress which is being made on the Continent and in America.

As we have already intimated, the Institute held its annual general meeting in London on Wednesday, Thursday, and Friday, the 5th, 6th, and 7th inst. The Report which was read was very encouraging; the number of members is now 832, and the financial statement is highly satisfactory.

The Bessemer Medal for 1875 has been awarded to Dr. Siemens, F.R.S., in recognition of the valuable services he has rendered to the iron and steel trades by his important inventions and investigations. Besides a number of foreign gentlemen, Dr. Percy, of the School of Mines, was elected an honorary member. The next provincial meeting is to be held in Manchester early in September.

Mr. Lowthian Bell, after a short address, resigned the chair, to which Mr. William Menelaus was elected. The address of Mr. Menelaus was mainly concerned with recent improvements in the manufacture of steel. Mr. Menelaus has evidently correct notions as to the method by which the industries with which he is connected are to be made the most of. "As an iron maker," he said, "my mission has been to bring into profitable use the valuable inventions of Bessemer, Siemens, and others, and to apply the scientific research of men like Mr. Bell to the improvement of old and new processes."

On the evening of Wednesday Mr. Warrington W. Smyth delivered a valuable lecture on "The Ores of Iron considered in their Geological Relations." Mr. Smyth directed attention to the oxides as met with by themselves, or combined with water or carbonic acid, and which formed the great bulk of the material employed in iron making. First in order of the ores thus limited was magnetite. This mineral, with 72·41 per cent. when pure, was the fine rich ore which had been worked with great success for centuries in several of the Scandinavian mines. In Italy fine examples of magnetite were also found, as well as in several widely-separated places in North America. Magnetite only occurred in a few localities in Great Britain, amongst which the vicinity of Penryn, in Cornwall, and Hey Tor, near Bovey, in Devon, were mentioned. The next species noticed by the lecturer was hæmatite. This ore, so little recognised thirty years ago, was now too well known to require to be enlarged on. He next described the curious ores named bauxite and wöchenite, in which alumina takes the place of the sesquioxide of iron, turgite, göthide, limonite, chalybite, the last-named often mixed with other ores on